THE JOURNAL OF THE SOCIETY OF AUTOMOTIVE ENGINEERS

INDEX TO VOLUME XVI, JANUARY-JUNE, 1925

	PAGES
January	1-108
February	109-258
March	259-384
April	385-474
May	475-550
June	551-664

A

Acceleration, cost of, high 394
Accelerometer and seismograph, difference between 571
Accessory-Drive layout in aircraft engines, timing-gear and 306

Accidents

Automobile 470
Investigation of 54
Reporting and investigation of 54
Statistics and reports 55

Acids in woods, few 525

Addresses

Ayres, Col L P 111, 195
Morgan, Dr A E 111
President Crane at annual meeting 129
Advantages of different voltage electrical systems for motorbuses (L P Michaud) 280

Advisory Board for United States Dictionary of Specifications

Activities 411
Representatives 155
Aeronautic Advisory Committee, S A E, personnel 537

Aeronautic Division, S A E

Personnel 151
Report at summer meeting 581, 594

Aeronautical Safety Code

Approved 581
Completed 493
Issued 25

Aeronautical Safety Code Sectional Committee, representatives 154

Aeronautics

Army-Navy standards approved 582
Naval, development in 361
Agricultural machinery engineering, development and research in Germany (Herr Otto Philipp) 490

Agricultural Power Equipment Division, S A E

Personnel 151, 296
Report at summer meeting 585

Air

Eliminated from central-point lubrication system, how, is 338
Loss of, from balloon tires 179

Airbrakes

Automotive 390, 399
Automotive—why and how 283, 596

Air-Cleaners

California tests, Hoffman questioned on 140b
Demonstration at session 140b
Dry, wet and oil types for convenience, classed as 371
Efficiency of 395
Essentials of satisfactory road-test 256
Final report on the 1924 California tests 140a, 367, 630
Intake should be high and directed toward the rear 368
Laboratory tests were made, how 371
Location of air intake 250
Methods of testing 246
Model of centrifugal, operated 140a
Oil-Type and dry-type show high efficiency 140a
Passenger-Car essentials 247
Principles employed in 246
Test secondary 255
Tested since last June, new 370
Tests 395
Turbulence effects on centrifugal 632
Value of 236
What tests have covered 367
Air-Cleaners on trucks in service (A H Hoffman) 140a, 249
Air-Cleaning by inertia forces 632
Air-Cleaning devices, efficiency of 381

Aircraft

Advantages of inverted-type engine 124
For defense 568
Limiting factors of engine design 619
Recent developments in engines 122, 297, 617
Safety Code issued 25
Aircraft for defense (Major-Gen Mason M Patrick) 568
Air-Fuel ratio, carbon-dioxide content not constant with 616

Air-Intake

Best location for carbureter 501
Should be high and directed toward the rear 368

Air Mail Service

New devices tested 273
Night flyers 381
Night flying 272
Transcontinental schedule 273
Air Mail Service (Col Paul Henderson) 272
Airplane superchargers (Dr Sanford Moss) 13

Airplanes

Armored walls 211
Cabin 213
Engine 210
Engine compartment 212
Maiden Detroit 212
Metal 125, 209
Mock-Ups 212
New plant at Dearborn 214
Quantity production of 209
Safety 210
Structural arrangement 211
Superchargers for 13, 400
Thick-Wing 211
Type selected 210
Wood versus metal 211
Air Service standards approved 582
Airship, 5000-ft 554

Air Temperature

Barometer and, affect power of engines 13
Rise in radiators 261
Alcohol from tubers and roots, power 546
ALLEN, H H, ON PERSONAL EQUATION IN AUTOMOBILE DRIVING 269, 415
Allowances and job setting 517
Alloy-Steel for heavy cars 540
Alloys, die-casting 397
ALSPAUGH, J S, ON PRE-SELECTIVE AUTOMATIC SHIFT 390
Aluminum-Bronze, composition change recommended 40
Amendments to Constitution, S A E, proposed 131
American Aeronautical Safety Code completed 493
American Engineering Standards Committee, representatives 155

American Engineering Standards Committee's

Special Committee on Preferred Numbers Activities 413
Representative 155
American Marine Standards Committee, representative 155

American Petroleum Institute

Meeting 4
Pew, J Edgar, elected president 6
Public relations committee formed 6

American Society for Testing Materials

Committee A1 on Steel, representative 155
Committee A7 on Malleable Iron, representatives 155
Analysis and making of repairs in factory 528
Analysis of steering mechanisms (F F Chandler) 279
Annual dinner, S A E 3, 111

Annual Meeting, S A E

Air-Cleaner session 140
Announced 3
Aviation session 125
Balloon tire session 135
Business session 126
Carnival 4, 139
Cooling session 140e
Lubrication session 140b
Passenger-Car body session 138
Program 4
Research session 119
Reviewed 119
Standards Committee reports 33
Steering and wheel-shimmy session 133
Wheel-Shimmy session 3
Anode wear in nickel-plating, compensation for 87
Another aspect of crankcase-oil dilution (Paul H Schweitzer) 92
Anti-Skid chains, use discouraged on motor-truck wheels 8
Appraising cars by comparison of mechanical efficiency (R B Wasson) 563
Arcaded streets proposed for New York City 403
Army-Navy conference 411
ARNOLD, LIEUT LESLIE, ON AROUND THE WORLD FLIGHT 485
Around the world flight (Lieut Leslie Arnold and Lieut Leigh Wade) 485
Artichokes, a possible source of fuel 546
Atmospheric distillation method of measuring crankcase-oil dilution subject to error 356
Audimeter detection of noise 629
AUEL, C B, ON UTILIZATION AND PREVENTION OF WASTE 223
Automobile accidents 470
Automobile and motor-truck shows 7
Automobile body suspension and riding-comfort (Prof Pierre Lemaire) 560
Automobile design and automotive steels (Thomas H Wickenden) 538
Automobile finishes (H C Mougey) 277
Automobile Headlighting Specifications Sectional Committee, representatives 154
Automobile merchandising systems (Ray W Sherman) 396
Automobile-Supercharger development during 1924 (David Gregg) 595

Automobiles

Accidents 470
Airbrakes 283, 390, 399, 596
Air-Cleaner essentials 247
All-Metal body design and construction 125, 219
Alloy-Steel for heavy 540
Appraising by comparison of mechanical efficiency 563
Audimeter detection of noise 629
Bayonet-Type lamp-door permitted 33
Braking and safety 19
Building of all-steel bodies 125, 219, 391
Cam-Operated gear-shifts 390
Car manufacturer's experiences with balloon tires (E A De Waters) 342
Certification of titles 54
Comparative risk of riding and walking 52
Conventional, successfully steam cooled 635
Design
  Automotive steels and 538
  Effect of balloon tires on 205, 620
  Metallurgist and 538
Desirable features of construction 58
Door hinges, standards recommended 41
Effects of balloon tires on car design 205, 620
Engine 276
Financing sales 580
Finishes 277
Finishing 11
Finishing-Material of the pyroxylin type 481
Fundamental principles of headlighting 564
Gear unjustly blamed, is 24
Hits curb, effect when 248
How hard does it steer 135, 183, 619
Hydraulic steering, possibilities of 566
Improvements 206
Influence on characteristics of American people 568
Inherent competition creates demand 195
License-Plate bracket-slots proposed 38
Life controls replacement market 196
Limit of stopping-distance 270
Manufacture of plate glass for 464
Mathematics of deceleration 270
Merchandising systems 396
Necessity for securing reliable data on steering 183
Noise, elimination of 627
Number and life of 150
Number of families the limiting factor 196
Output of 3,600,000 this year 208
Painting and finishing 261
Personal equation in driving 269, 415
Possible improvements in design 275, 484
Power and gasoline economy of present-day passenger 102
Preparation for refinishing 481
Prices in Germany 61
Psychology of driving 269
Racing 138
Repainting used cars to increase their salability 556
Results of service-station adjustment 103
Riding-Quality bibliography 261
Road performance 103
Safety code on brakes and brake testing 23
Sensational first ride 392
Shows 7
Speed 54
Storage-Batteries
  Operation and care 503
  Specifications 39
Suggested improvements 275
Supercharger development during 1924 595
Superchargers used on racing 400
Survival of the fittest 396
Synchronized vibratory motion 627
Type of car and fuel used 102
Automotive airbrakes—why and how (H D Hukill) 283, 390, 399, 596
Automotive courses of study 162

Automotive Electrical Systems

Change of excitation 575
Charging economics 577
Circuit-Breaker and regulation adjustments 576
History 574
Regulator 576
Third-Brush-Controlled generator 573
Two compared 578
Voltage-Regulated system 575
Voltage regulation 574
Voltage-Regulation advantages, summary of 579
Voltage, regulation of 280, 573
Automotive exports 182

Automotive Industry

Economies in machine-shop operations 460
European 7
Exports 182
Industrial conditions 468
Law of supply and demand 396
Manufacturer's agent 396
Pyramidal form of distribution 396
Recent progress in various fields of engineering 401
Surveys 396
Automotive railroad cars (E J Brennan and E R Manor) 401

Automotive Service Meeting

Program 490
Reviewed 553
Automotive storage-battery, its operation and care (T R Cook) 503

Aviation

Airship of 5000 ft 554
Around the world by air 484
Development 13
Insurance 101
Night flying 272
Prophecy of E V Rickenbacker 554
Progress of civil 52
Aviation development (Major E L Hoffman) 13

Axle and Wheels Division, S A E

Personnel 151, 537
Report at annual meeting 36

Axles

Material for center 539
Oil is carried from frame to 340
Stress in front, center under maximum vertical-load 539
Stresses and factor of safety in front 539
Stresses in center and steering-knuckle when turning a corner 540
Ayres, Col L P, on Saturation-Point for Motor Cars Pushed Ahead to 27,000,000 111, 195

B

Babbitting unit, special, for connecting-rods 488
Bachman, B B, on European Automotive Practice 7
Balance, parts operating in engine need 168
Balancing of clutches important 9

Ball and Roller Bearings Division, S A E

Activities 145, 497
Personnel 151
Report at summer meeting 587
Ball Bearings, metric-type thrust 145
Ball Bearings Sectional Committee, representatives 155

Balloon Tires

Adopting arbitrary sizes 343
Car manufacturer's experiences with 342
Description 424
Development 136
Difference in area of contact 137
Effects on car design 205, 620
Factors accompanying low pressure 342
Front less susceptible to puncture 344
Glimpses of progress 136, 172, 626
Improving operation 137
Increase in size of footprints 207
Instability of 190
Lateral instability 134
Lateral stability 206
Loss of air from tubes 179
Measuring inertia of 230
Plies of cord fabric 175
Pressures recommended 497
Records of tests 344
Rim widths 174
Side-Slip 207
Six versus four plies 342
Sounds and noises 179
Springs, effect on 10
Still in experimental state 343
Wheel shimmy caused by 181
Banks, W F, on Commercialized Motor-Truck Haulage 62
Barometer affects power of engines 13
Barron, R C, on Production of Connecting-Rods 488
Basic inventions to come 595
Battery or magneto ignition for aircraft engines 307
Battery tray terminal proposed 42
Bayonet-Type lamp-door permitted 33
Beads, tire 422
Bean, W L, on Gasoline Railroad-Car for Branch Lines 318
Bearing-Caps, drilling of 60

Bearings

Design 274
Engine 125
Failure of 301
Oil distribution to steering-mechanism, and spring-shackles 340
Requirements of 302
Belt-Cutting, saving in, at automobile plant 91
Belt-Shifter forks 529
Belt-Speeds, tractor 491
Bending stresses in crankshaft and crankcase 169
Bersie, Hugh G, on Developments in Motorbus-Body Design 310
Best location for carbureter intake (A H Hoffman) 501
Beveridge, Albert J, on Influence of the Motor Car on the Characteristics of the American People 568

Bibliography

Oscillograph 455
Piezo-Electric effects 455
Riding-Qualities of automobiles 261
Sound transmission 455
Bijur, Joseph, on Central-Point Chassis-Lubrication System 278, 335
Blackburn, L A, on Organizing for Plant Maintenance Work 527
Blocking the springs 228

Bodies

All-Metal design and construction 125, 219
Building of all-steel vehicle 125, 219, 391
Closed, panels formed in one piece 222
Details of construction 217
Developments in motorbus, design 310
English patent specifications 216
Finishing requires less preliminary work 231
Light, essential 275
Metal-Workers' progress paved the way 220
Outer covering and finish 218
Outgrowth of structural development 220
Steel has greater strength with less bulk 222
Steel sections have smaller area 221

Bodies (Concluded)
Suspension and riding-comfort of automobile 560
Trailers and, for motor transportation 313
Weymann silent flexible 138, 215
Wood, are sheathed with metal 220

Body Builders
Custom, role of 139
Problems 221

Bolt, Nut and Rivet Proportions Sectional Committee, representatives 155
Bounces of tire, tests 135
Boundary lubrication 471
BOUTON, EUGENE, ON PRODUCTION OF CONNECTING-RODS 488
BRAGG, CALEB S, ON VACUUM BOOSTER BRAKE 399
Brains of production (Charles B Gordy) 271, 604
Brake and Brake Testing Sectional Committee, representatives 155
Brake-Lining rivets, subdivision on, appointed 496

Brake-Linings
Improvements 276
Material 400

Brake linkage, oiling universal-joints and 340

Brakes
Factors that affect stopping-distances 20
Foot, recommendation for 19
Hand, recommendation for 20
Moderate power desirable for vacuum 399
Road surface, speed and pedal pressures influence tests 20
Safety code on automobile testing 23
Trucks, recommendations for 20
Vacuum, application of 399

Breakdowns of machines and their causes 528
Breaker fabric for tires 423
BRENNAN, E J, ON AUTOMOTIVE RAILROAD CARS 401
British industry, status of 76
BRYAN, H F, ON KEROSENE IN TRACTOR ENGINES 491
BUDD, E G, ON BUILDING OF ALL-STEEL VEHICLE BODIES 125, 219
Buffing copper-plating 88
Building all-steel vehicle-bodies (Walter A Graf) 391
Building of all-steel vehicle bodies (E G Budd and J Ledwinka) 125, 219
Bureau of Standards fuel research report 4
Bureau of Standards work (S W Sparrow) 13
BURGER, L F, ON TRACTOR IGNITION 491
BURGESS, G K, ON GAGES, A KEY PROBLEM 456
BURKHARDT, O M, ON WHEEL SHIMMYING: ITS CAUSES AND CURE 134, 189, 354, 619
Bushing practice, proposed piston-pin and 494
Business and optimism (Charles M Schwab) 568
Business conditions, forecasting 472
Business outlook 341

C

Cable terminals, non-standard, costly 148
CAIN, JAMES W, ON MOTOR RAIL-CARS 312
Calculation and design of coil springs (E W Stewart) 492

Calibration
Sound detector 452
Test apparatus 625

California, some notes on automobile stages in 321
Cam-Operated gear-shifts 390
CAMPBELL, L J, ON TRANSMISSIONS 390
Camshafts, detector for registering torsional vibration 445
Can motorbuses relieve traffic congestion (Phil Harris) 488
Capillary funnel method simple and approximate 357
Car manufacturer's experiences with balloon tires (E A DeWaters) 342
Carbon and sludge analyzed 254
Carbon-Content of oil 232
Carbon deposits and preignition knocks 104

Carbon Dioxide
Carbon monoxide and hydrogen and, relation of 614
Content not constant with air-fuel ratio 616

Carbon monoxide and dioxide and hydrogen, relation of 614

Carbureters
Adjustment for mileage 103
Adjustment study by exhaust-gas analysis 104
Best location for intake 501
Throttle levers 496

Carcass or fabric structure of tires 422
Carnival at annual meeting 139
CASSERLY, J F, ON WHAT PUBLIC SERVICE UTILITY COMPANIES WANT IN MOTOR VEHICLES 486
Caster angle, influence on wheel wabble 230

Catalysis
Defined 435
Negative 438
Velocity of chemical reactions and 433

Cause and prevention of accidents (G M Graham) 12
Causes of surface checks in wood in varnish-drying rooms (Harry D Tiemann) 523
Census of manufacturers for 1923 354
Central-Point chassis-lubrication system (Joseph Bijur) 278, 335

Central-Point Lubrication
Air is eliminated from system, how 338
Distribution of oil to steering-mechanism bearings and spring-shackles 340
Drip-Plugs control oil flow 336
Like single-wire electrical system 339
Lubricator and pump construction 338
Oil carried from frame to axles, how 340
Oil flow rate 337
Oiling universal-joints and brake linkage 340
System normally not under pressure 336

Certification of titles of automobiles 54
Chain Division, S A E, personnel 151
CHANDLER, F F, ON ANALYSIS OF STEERING MECHANISMS 279
CHANDLER, F F, ON HOW HARD DOES A CAR STEER? 135, 183, 619
Change of excitation 575
Changing world 194
Charging economics 577
Charts reveal, what 446
CHASE, HERBERT, ON POSSIBLE IMPROVEMENTS IN PASSENGER-CAR DESIGN 275, 484

Chassis
Central-Point lubrication 278, 335
Laboratory tests for enamels 11
Production precautions for painting 11
Testing truck before shipment 373

Chemical equilibrium in burning mixture 616
Chemical reactions and catalysis, velocity of 433
Chicago Section inspects Underwriters' Laboratories 6
China's foreign trade 420
Chromium-Silico-Manganese steel 148
Chucking, methods of 514
CHURCH, MAJOR ELIHU, ON FREIGHT TRANSPORTATION 486
CHURGAY, L A, ON TOOL SALVAGE 458
Circuit-Breaker and regulation adjustments 576
City planning and zoning 55
CLAYDEN, A L, ON FUNCTION OF LUBRICANTS 77
Cleaning of nickel-plate before testing, importance of thorough 86
Cleveland 1925 sportsmobile 568
Cleveland Section outing 568

Clutch Bearings Standard
Cancelled 587
Needed 497

Clutch discs, limits recommended 588

Clutches
Balancing important 9
Development of automotive 8, 562
Molded facing resists heat better than woven 8
Pedal and lining pressures, recommended 10
Thermally efficient 9

Code on Colors for Traffic Signals Sectional Committee, representative 155
COFFIN, HOWARD A, ON PERSONAL EQUATION IN SERVICE PROFITS 553

Coin-Press
Results from other means 512
Specification of capacity 511

Coin-Pressing
Extruded metal due to 513
Multiple 511

Coining-Press operation (A R Kelso) 510
Cold-Drawn tubing 472
COLE, DALE S, ON VOLTAGE REGULATION OF AUTOMOTIVE ELECTRICAL SYSTEMS 280, 573
COLLINS, E V, ON TRACTOR WHEEL-LUGS TESTED 490
Coloring of tires 423

Combustion-Chamber
Covered by water 639
Temperatures 634

Commercial application of aircraft engines 299
Commercialized motor-truck haulage (J A Hoffman and W F Banks) 62

Committees
Administrative, S A E, personnel 156
Advisory Board for United States Dictionary of Specifications
Activities 411
Representatives 155
Aeronautical Safety Code, Sectional, representatives 154
American Engineering Standards, representatives 155
American Engineering Standards on Preferred Numbers
Activities 413
Representative 155
American Marine Standards, representatives 155
American Society for Testing Materials A1 on Steel, representative 155
American Society for Testing Materials A7 on Malleable Iron, representatives 155
Automobile Headlighting Specifications Sectional, representatives 154
Ball Bearings Sectional, representatives 155
Bolt, Nut and Rivet Proportions Sectional
Report 145
Representatives 155
Brakes and Brake Testing Sectional, representatives 155
Code on Colors for Traffic Signals Sectional, representatives 155
Conference on Aeronautical Nomenclature of National Advisory Committee for Aeronautics, representatives 155
Constitution, S A E, personnel 156
Consulting of the Central Committee on Lumber Standards, representative 156
Cooperating, personnel 154
Ferrous Metals of the Bureau of Standards, representatives 155
Finance Committee, S A E, personnel 156
Gage Steel of Bureau of Standards
Activities 456
Representatives 156
Gears Sectional, representatives 155

Committees (Concluded)

Hardwood Consulting of Central Committee on Lumber Standards, representatives 156, 537
Highways, S A E, personnel 162, 262, 296
House, S A E, personnel 156
Insulated Wire and Cable Sectional, representatives 155
Joint Army and Navy Aeronautic Conference, representatives 156
Joint, on Investigation of Phosphorous and Sulphur in Steel, representative 156
Machine-Tool Safety Code Sectional, representative 155
Meetings, S A E, personnel 156
Membership, S A E, personnel 156
Methods of Expressing Limits and Tolerances, S A E, personnel 154
Motor-Vehicle Lighting Sectional Committee, representatives 296
National Screw Threads Commission, representatives 156
Numbering of Steels Sectional, representatives 155, 296
Patents, S A E, personnel 154
Petroleum Products and Lubricants, activities 497
Pipe Flanges and Fittings Sectional, representative 155
Plain Limit Gages Sectional, representatives 155
Preferred numbers, special American Engineering Standards Committee on
Activities 413
Representatives 155
Publication, S A E, personnel 156
Research, S A E, personnel 162
Screw Threads Sectional, representatives 155
Sectional, personnel 154
Sections, S A E, personnel 156
Special, S A E, personnel 154
Specifications for Zinc Coating of Iron and Steel Sectional Committee, representatives 156
Standardization of Transmission Chains and Sprockets Sectional Committee, representatives 156
Standardization Policy, S A E
Activities 264
Personnel 154
Standardizing, on which Society is represented 155
Standards, S A E, personnel 151
Structures and Fabricated Metals of the Bureau of Standards, representatives 155
Technical, personnel 151
Commodity-Distribution in London and its environs, small-consignment 326
Comparative risk of riding and walking 52
Comparison of *PV* values in aircraft engines 302
Compartment trucks for pipe fittings 85
Competition creates demand, inherent 195
Composition requirements of materials 380

Compression

Condensation during 94
Conditions 98
Effect of 95

Compression-Type Fittings

Extended 591
Proposed 34
Concrete slabs, static-load tests of 23
Condensation during compression 94
Condenser, radiator more efficient as 639
Conference on Aeronautical Nomenclature of National Advisory Committee for Aeronautics, representatives 155
Congested impotence 600
Connecting-Rod design, application of research to 404

Connecting-Rods

Babbitting unit, special 488
No shims used in manufacture or assembling 488
Production of 488
Constant-Mesh hydraulic transmission 389
Control of motor trucks 69
Constitution, S A E, amendments, proposed 131
Constitution Committee, S A E, personnel 156
Consulting Committee of the Central Committee on Lumber Standards, representative 156
Cook, T R, on Automotive Storage-Battery, Its Operation and Care 503

Cooling

Danger of hot-spots 636
Exhaust-Valves in aircraft engines 305
Cooperation 476

Copper-Plating

Buffing 88
Process 87
Cord tires 422
Cost of operation and the economic life of a motor truck (Joseph Scott, Eugene Power and W F Fairbanks) 274
Cost of production here and abroad 182

Costs

Acceleration, high 394
Efficiency and 518
Fixtures, purposes of and 515
Freight transportation by six-wheel truck 430
Highway transportation 22
Instrument 469
Job, motor trucks 71
Motorbus tire 347
Motor-Truck operation 70
Operation and the economic life of a motor truck 274
Power and other, in factory 532
Production, here and abroad 182

Council Meeting, S A E

December, 1924 81
January, 1925 156
February 296
April 537
Country's domestic and international trade 647
Courts, traffic 54
Crane, H M, on Fundamental Principles of Automobile Headlighting 564
Crane, H M, presidential address 129
Crankcase drain-plugs 496

Crankcase

Aircraft engines 308
Bending stresses in 169

Crankcase-Oil Contamination

Dilution and 498, 572
Preventing, means for 500
Relation to dilution 499

Crankcase-Oil Dilution

Another aspect of 92
Atmospheric distillation method of measuring subject to error 356
Capillary funnel method of measuring simple and approximate 357
Cause of 117, 398
Causes and measurement 398
Causes and practical remedies 498
Choice of standard methods of measuring should be considered carefully 358
Contamination and 498, 572
Demonstration of apparatus for measuring 140d
Detriment versus value, conflicting opinions of 499
Evaluation of 398
Explained 99
Jacket-Water temperature, effect of 93
Lower end-point of fuel the intrinsic cause 498
Lubrication and 116
Measurement 140d
Measuring the percentage of 355
Method of measuring that combines speed with accuracy 357
Methods that have been proposed for measurement 355
Objections to various methods for measuring 356
Relation to contamination 499
Remedies for 100, 242
Separation of distillate by specific gravity 356
Simpler method developed for measurement 398
Starting, effect of, on 118
Steam distillation methods of measuring empirical 357
Suggested explanation of 92
Vacuum distillation transition method for measurement of 17, 358
Various phases of problem 161
Crankcase-Oil dilution 4
Crankcase-Oil dilution, its causes and measurement (S W Sparrow and T S Sligh, Jr) 398
Crankcase oil specifications, proposed revision 266

Crankshafts

Aircraft engine 303
Bending stresses in 169
Detector for registering torsional vibration 445
Rigidity and weight determine vibration period 170
Rubber 3
Winds and unwinds 170
Crossing of a crowned road, chart of the 188
Cultivation demands 50
Cultural education for engineers 546
Cylinder-Wall, pressure feed to 479

Cylinders

Aircraft engine, construction of 303
Design for aircraft engine 123
Lubrication 112
Recording indicator for pressures 444
Wear 276
Wind velocity on rotating, effect of 599

D

Danse, L A, on Metallurgy of Bearings 554
Danse, L A, on Production and Metallurgy of Steel 482
Data Sheets, March issue 413
Davis, F W, on When Does a Motor-Truck Become Obsolete? 601
Day, R B, on Prevention of Shimmying 136, 192
Days and hours in service in fleet operation 536
Dayton Section inspects McCook Field 568
Deceleration, mathematics of 270
DeLeeuw, A L, on Possible Economies in Automotive Machine-Shop Operations 460
Design of Diesel engines (Philip L Scott) 483

Detector

Registering torsional vibration 445
Rochelle salt-crystal 450
Sound
Application of 450
Calibration of 452
Telemeter as vibration, use of 454
Vibration, application of 448
Detector for registering torsional vibration 445
Detriment versus value of crankcase-oil dilution, conflicting opinions of 499
Development in Naval aeronautics (Com H C Richardson) 361
Development of automotive clutches (E E Wemp) 8, 562
Development of men in factory 533
Developments in motorbus-body design (Hugh G Bersie) 310
Developments in transmission (E B Sturges) 389
Device that measures sustained noises 451

DeWaters, E A, on Car Manufacturer's Experiences with Balloon Tires 342
Diamant, N S, on Principles of Steam-Cooling Systems 140e, 330, 632
Dickey, H L, on Engine Lubrication 562
Die-Castings (Marc Stern, B F Lewis and R L Shepard) 397

Die-Castings

Alloys 397
Plating of 397

Differential, omission of, on motor trucks 15

Dinners

Annual, S A E
Announced 3
Reviewed 111
Indiana Section 485, 567
Direction of resultant force and wind 599
Distillate, separation of, by specific gravity 356
Domestic and international trade, Country's 647
Door-Hinge standards recommended 41
Drag-Link, instrument for testing steering 186
Drain-Plugs, crankcase 496
Drilling of bearing-caps 60
Drip-Plugs control oil flow 336
Drive in aircraft engines 308
Drivers of motor trucks 68

Driving

Description of apparatus for tests 415
Personal equation in automobile 269, 415
Driving-Shafts, rear-axle 543
Drop-Center rims 136
Dry, wet and oil types of air-cleaners 371
Dunning, Leighton, on Shock-Absorbing Devices 10
Durability of nitro-cellulose (L Valentine Pulsifer) 277
Durability of plated surfaces (W M Phillips) 73

Dust

Amount encountered 254
Character of test 631
Characteristics demonstrated 140
Considerations relating to wear 631
Physical characteristics of road and of field 140, 243, 630
Physical data 244
Problem 243
Rate of feed 631
Relation to engine wear 246
Road, may be detected, how 233

E

Earnings of industrial workers 366
Ease of control of rotor-ship 600
Economic aspect of tooling for interchangeable production (Joseph Lannen) 59, 225

Economy

Cost of operation and life of a motor truck 274
Operation, of six-wheel truck 114, 430
Possible in automotive machine-shop operations 460

Education

Cultural, for engineers 546
Leadership in industry 402
Safety 55, 57
Theory and technique 402
Education for leadership in industry 402
Education in safety 57
Education in schools and provision of playgrounds, safety 55
Effect of grain on strength of steels 572
Effects of balloon tires on car design (J W White) 205, 620

Efficiency

Appraising cars by comparison of mechanical 563
Costs and 518
Mechanical, of engines increased by higher temperatures 635
Oil-Type and dry-type show high 140a
Efficiency of air-cleaning devices (A H Hoffman) 381, 395
Eisinger, J O, on Recent Cooperative-Fuel-Research Progress 140c, 237

Electric Vehicle Division, S A E

Personnel 152
Report at annual meeting 42, 157

Electrical Equipment Division, S A E

Activities 148
Personnel 152, 296
Report at summer meeting 587
Electrical instruments for automotive research, some new (J H Hunt) 282, 444, 480
Electrical instruments have wide application 454
Electrical system, central-point lubrication like single-wire 339

Electricity

In Italy, use of 646
On the farm 492

Embshoff, G F, on Some New Electrical Instruments for Automotive Research 282, 444
Engine bed-timbers adopted 589
Engine-Cylinder lubrication (Neil MacCoull) 112

Engine Division, S A E

Activities 411, 494
Personnel 152
Report
Annual meeting 39, 40, 157
Summer meeting 588
Engine governors (E F Lowe) 116
Engine lubrication (H L Dickey) 562
Engine reconditioning (R C McWane) 554
Engine vibration (C E Summers) 11
Engineer, what he has done for humanity (C F Kettering) 567

Engineering

Agricultural machinery, development and research 490
Features in tractors 51
Progress in general-purpose farm-tractor 47
Recent progress in various fields of automotive 401
Safety 533
Engineering progress in general-purpose farm-tractor development (O B Zimmerman) 47

Engineers

Cultural education for 546
What he has done for humanity 567

Engines

Adjustment 103
Airplane 210
Air temperature and barometer affect power 13
Automobile 276
Bearings 125
Bed-Timbers adopted 589
Carbon and sludge analyzed 254
Carbon deposits and preignition knocks 104
Combustion Chamber
Covered by water 639
Temperatures 634
Commercial application of aircraft 299
Comparison of *PV* values 302
Compartment 212
Condensation during compression 94
Crankcase for aircraft 308
Crankshafts 303
Cylinder design for aircraft 123
Diesel design 483
Drive for aircraft 308
Fevers and chills avoided 330
Flywheel-Housing No 0 added 39
Foreign material in used oil; its character and effect on design 140b, 232
Function of lubricants 77
Glass bushing shows oil movement 480
Governors 116
"Growth" of pistons 253
Higher temperature increases mechanical efficiency 635
History and applications of Diesel 483
Internal-Combustion, tractors 47
Inverted aircraft, advantages of 308
Inverted-type, advantages of 124
Kerosene in tractor 491
Limiting factors of aircraft design 619
Location of hold-down flange 304
Lubrication 562
Lubrication of gasoline 479
Marine, described 274
Measurement of vibration phenomena 131, 163, 639
Measurements were taken, how 252
Mechanical friction as affected by the lubricant 77
Modern high-speed marine 274
Multiple-Cluster valve-springs in aircraft 306
New instrument makes records of vibration 165
Oil for, versus engines for oil 5, 77
Oil, how, affect 400
Other differences unaccounted for 255
Parts operating in, need balance 168
Peculiarities of wear 253
Practical application of steam cooling to present 634
Preparation of, for test 249
Principles of steam-cooling systems 140e, 330, 632
Radial 594
Recent development in aircraft 122, 297, 617
Reconditioning 554
Relation of dust to wear 246
Removal of coarse particles prevents wear 140a
Research on tractor 491
Sleeve-Valve 277
Steam-Cooling 561
Steam-Cooling of internal-combustion 140e
Study of details of aircraft 122, 299
Superchargers for automotive, advantages of 400
Support-Arm widths recommended 40
Thermodynamic principles, application of 97
Timing-Gear and accessory-drive layout in aircraft 306
Torsional vibration is recorded, how 167
Valve-Housing of aircraft 304
Valve-Spring breakages, causes of, in aircraft 306
Vibration 11
Engines for oil versus oil for engines 5, 77
Equalization of wages 518
Equipment for nickel-plating, improvements in 87
Erskine, J S, on Tractor Design Progress 401
Estimate of production 606
Europe, market for standard parts in 145
European automotive practice (B B Bachman) 7
European ports, freight in 486
Evaluation of crankcase-oil dilution 398
Evaluator, loudness 381
Evaporation, amount of 240

Exhaust Gas

Analysis 612
Carbon-Dioxide content not constant with the air-fuel ratio 616
Chemical equilibrium in burning mixture 616
Taking samples 612

Exhaust-Gas Analysis

Apparatus for making 612
Carbon dioxide and monoxide and hydrogen, relation of 614
Carbureter-Adjustment study by 104
Checking accuracy of 613
Experimental method and its results 614
Method of, by thermal conductivity, new 613
Exhaust-Valve, cooling of aircraft engine 305
Exhibit at Cleveland Automobile Show, S A E 118
Experiences and observations in Europe and Northern Africa (C F Kettering) 278
Experimental state, balloon tires still in 343
Explanation of natural phenomena 646
Exponential studies of fuels, critical 95
Export trade 509
Extruded metal due to coin-pressing 513

F

Fabric

Breaker, in tires 423
Plies of cord, in balloon tires 175
Structure 422
FAIRBANKS, W F, ON COST OF OPERATION AND THE ECONOMIC LIFE OF A MOTOR TRUCK 274

Farm

Electricity on 492
Products, value of 1924 600
Value of 1924 products 600
Fatty acids improve mineral oils 480
FAVARY, E, ON SIX-WHEEL TRUCK CONSTRUCTION AND OPERATION 114, 427, 487
Ferrous Metals Committee of the Bureau of Standards, representatives 155
Field service-inspections 373
FIELDER, R E, ON SYSTEM FOR CONTROLLING MOTORBUS MAINTENANCE 345
Filling stations for motorbuses 349
Final report on the 1924 California air-cleaner tests (A H Hoffman) 140a, 367, 630
Finance Committee, S A E, personnel 156
Financing car sales 580
Finishing of automobiles (H C Mougey) 11
Finishing-Material of the pyroxylin type (J J Riley) 481
Firemen and patrolmen at automobile plant 84
FITZPATRICK, A W, ON EARLY DAYS OF TRACTOR INDUSTRY 490
Fixed-Rental system of motor-truck fleet-operation 534
Fixtures, purposes and cost of 515
Flange, location of hold-down 304
Flat-Rate service-systems (H T Pierce, P U Holloway and F P Rudolph) 394
Flat-Rate system applied to electrical repairs (Matthew Kissinger) 6

Flat-Rates

Actual figures given 555
Advocated 554
Making a success of, and piecework 555
Team competition successful 555
Flat-Rates advocated (Don T Hastings) 554

Fleet Operation

Days and hours in service 536
Few errors in parts orders 537
Fixed-Rental system 534
Observations of a superintendent of motor-truck 534
Rental plan should include overhead 536
Requires 24-hr service on parts 535
Unit plan of overhauling 535
Flettner rotor-ship 599
Flexible-Disc standard recommended 38
Flow layouts 606

Flywheel Housings

Flywheels and 494
No 0 added 39
Flywheels and flywheel housings 494
Ford plant, maintenance practice at 527
Forecasting business conditions 472
Foreign markets 381
Foreign material in used oil: its character and effect on engine design (G A Round) 140b, 232
Foreign trade, China's 420
Four versus six-ply balloon tires 343
FOX, J H, ON MANUFACTURE OF PLATE GLASS FOR AUTOMOBILE USES 464
Frame, how oil is carried from, to axles, 340

Frames

Causes of variations in design 389
Design of 545
Kick-Up and width of blank 389
Manufacturers' standards 389
Saving in set-up time 388
Standardization of 388
Frames Division, S A E, personnel 152, 296
France, reconstruction of devastated 76
Freight in European ports 486
Freight transportation (Major Elihu Church) 486

Friction

Coat of tires 423
Drive again advocated 390
Mechanical, as affected by the lubricant 77
Front-Wheel shimmying (W R Strickland) 133, 277, 620
Fuel and lubrication tube fittings, proposed changes 496

Fuel Consumption

Decreases with age of motor truck 537
Measuring, by weight 610
Fuel research report of Bureau of Standards 4
Fuel utilization and lubrication problems (Neil MacCoull) 5

Fuels

Amount of 238
Artichokes, a possible source of 546
Compression
Condensation during 94
Conditions 98
Effect of 95
Condensation during compression 94
Direction and scope of research 237
Evaporation, amount of 240
Exponential studies, critical 95
Lower end-point intrinsic cause of crankcase-oil dilution 498
Measuring consumption by weight 610
Mineral or vegetable 546
Recent cooperative research progress 140c, 237
Research 161
Sulphur in 161
Synthetic liquid 403
Unevaporated particles 99
Used and type of car 102
Fuels Group of Research Committee, S A E, personnel 162
Function of lubricants (A L Clayden) 77
Fundamental principles of automobile headlighting (H M Crane) 564

G

Gage points, locating and 514
Gage Steel Committee of Bureau of Standards
Activities 456
Representatives 156
Gages
Key problem 456
Laboratory wear-tests 456
Service wear-tests 456
Gages, a key problem (G K Burgess) 456
Gaging nut slots, method proposed 33
GAMBILL, C E, ON MAKING THE SERVICE DEPARTMENT PAY 556
Garage conditions in motor-truck haulage 66

Gasoline

Consumption by motorbuses 351
Economy of present-day passenger-automobile 102
Gasoline railroad-car for branch lines (W L Bean) 318

Gear-Shifts

Cam operated 390
Pre-Selective automatic 390

Gear Teeth

Flow-Lines in 482
Load required to break 542
Gear tests at the National Physical Laboratory 420

Gears

Chucking, methods of 513
Differentials proposed, standard 36
Factors that affect accuracy 514
Research 162
Tests at the National Physical Laboratory 420
Transmission 542
Unjustly blamed, is 24
Gears Sectional Committee, representatives 155
Generation of accelerating forces 628

Generators

Circuit-Breaker and regulation adjustments 576
Third-Brush-Controlled 573
Geometry of the steering-gear 228
Germany, standardization in 144
GILL, J D, ON SOME ASPECTS OF THE PETROLEUM SITUATION 478
Glass bushing shows oil movement 480
Glimpses of balloon-tire progress (B J Lemon) 136, 172, 626
GORDY, CHARLES B, ON BRAINS OF PRODUCTION 271, 604
Governors, engine 116
GOW, WILLIAM G, ON MAKING A SUCCESS OF FLAT-RATES AND PIECEWORK 555
Grade crossings 54
GRAF, WALTER A, ON BUILDING ALL-STEEL VEHICLE-BODIES 391
GRAHAM, G M, ON CAUSE AND PREVENTION OF ACCIDENTS 12
Gravel street, chart from a 188
GRAVES, W H, ON IMPROVED NICKEL-PLATING METHODS 86
GREGG, DAVID, ON AUTOMOBILE-SUPERCHARGER DEVELOPMENT DURING 1924 595
Grinding fixtures and tolerances 515
GROVES, W B, ON SHOCK-ABSORBERS 401
Group bonus or group piecework 516

Group Bonus-System

Distribution of bonus and hourly rate 520
Other users of the 521
Where it is used 519
Group-Bonus wage-payment 61
Group piecework or group bonus 516

Group Wage-Payment Plan

Rectification of error 520
Size of groups and adjustment 519
Group wage-payment plan (H G Perkins) 516
"Growth" of pistons 253

H

Hardwood Consulting Committee of Central Committee on Lumber Standards, representatives 156, 537
Hardwood Lumber Standardization Committee, representatives 154, 296

HARRIS, PHIL, ON CAN MOTORBUSES RELIEVE TRAFFIC CONGESTION? 488
HASTINGS, DON T, ON FLAT-RATES ADVOCATED 554

Haulage

Commercialized motor-truck 62
Equipment 65
Garage conditions 66
Kinds of business and how obtained 63
Less-Than-Carload freight 65
Management 63
Plants and equipment 62
Sales resistance 64
Standardization of parts 67

Head-Lamps

Control of beam 564
Doors 33
Enforcement of regulations necessary 565
Intensity of illumination 564
Light controlled by driver 565
Standard revised 46
Suggested changes in mounting 564
Headlighting, fundamental principles of automobile 564
HEALY, L J D, ON PNEUMATIC-TIRE ELEMENTS AND DEVELOPMENT 421
HENDERSON, COL PAUL, ON AIR MAIL SERVICE 272
HERRESHOFF, ALEXANDER, ON STEAM-COOLING 561
HERRINGTON, A W S, ON MULTI-WHEEL VEHICLES 15
Highway and rail 547
Highway expenditures and maintenance 467
Highway research pays 22

Highways and Roads

Causes of failures 428
City planning and zoning 55
Conduct of drivers and pedestrians 57
Construction 56
Crossing of a crowned, chart of the 188
Dust may be detected, how 233
Expenditures and maintenance 467
Grade crossings 54
Justification for research 23
Maximum lane capacity 270
Performance 103
Physical characteristics of dust 140, 243
Rail and 547
Research 161
Research pays 22
Safety 53
Six-Wheel trucks and their effect on 114
Surface, effect on brakes 20
Traffic analysis 23
Transportation cost elements 22
Weight data of motor vehicles primarily for design 8
Highways Committee, S A E, personnel 162, 262, 296
HILL, L C, ON REPAINTING USED CARS TO INCREASE THEIR SALABILITY 556
HOFFMAN, A H, ON AIR-CLEANERS ON TRUCKS IN SERVICE 140a, 249
HOFFMAN, A H, ON BEST LOCATION FOR CARBURETER INTAKE 501
HOFFMAN, A H, ON EFFICIENCY OF AIR-CLEANING DEVICES 381, 395
HOFFMAN, A H, ON FINAL REPORT ON THE 1924 CALIFORNIA AIR-CLEANER TESTS 140a, 367, 630
HOFFMAN, MAJOR E L, ON AVIATION DEVELOPMENT 13
HOFFMAN, J A, ON COMMERCIALIZED MOTOR-TRUCK HAULAGE 62
HOLLOWAY, P U, ON FLAT-RATE SERVICE-SYSTEMS 394
HORNING, H L, ON LUBRICATION 563
HORNING, H L, ON LUBRICATION OF GASOLINE ENGINES 479
HORNING, H L, ON RECENT PROGRESS IN VARIOUS FIELDS OF AUTOMOTIVE ENGINEERING 401
HORNING, H L, ON RESEARCH ON TRACTOR ENGINES 491
HORNING, H L, ON ROAD AND RIDING ABILITY 392
Horning, President-Elect H L, comments at annual meeting 130

Hot-Spots

Danger of, in cooling 636
Turbulence, increased, prevents 637
House Committee, S A E, personnel 156
How engines affect oils (L Wagner) 400
How hard does a car steer (F F Chandler) 135, 183, 619
HOWARD, H W, ON TRAILERS AND DEMOUNTABLE BODIES FOR MOTOR TRANSPORTATION 313
HOWELL, F D, ON SOME NOTES ON AUTOMOBILE STAGES IN CALIFORNIA 321
HUKILL, H D, ON AUTOMOTIVE AIRBRAKE —WHY AND HOW 283, 390, 399, 596
HUNT, J H, ON SOME NEW ELECTRICAL INSTRUMENTS FOR AUTOMOTIVE RESEARCH 282, 444, 480
Hydraulic check for damping wheel shimmy 230
Hydraulic versus toggle-press operation 511
Hydrogen and carbon monoxide and dioxide, relation of 614

I

Ignition

Magneto or battery for aircraft engines 307
Tractor 491

Impact

Concrete slabs, tests of 23
Mathematical analysis of 430
Motor-Truck, investigation of 21
Test of six-wheel truck 430
Tests of motor trucks 23
Tests of trucks 114
Impact and static-load tests of concrete slabs 23
Impotence, congested 600
Improved nickel-plating methods (W H Graves) 86

Indicators

Pressure, for long runs 611
Recording, for cylinder pressures 444
Industrial standardization (F L Rhodes) 379
Industrial workers, earnings of 366
Industry, education for leadership in 402
Inertia, balloon tire, measured 230

Inflation-Pressure

Stiffness of springs versus 190
Tires 177
Influence of F W Taylor 605
Influence of the motor car on the characteristics of the American people (Albert J Beveridge) 568

Inspection

Motor, in factory 531
Motor-Truck 67
Motor-Vehicle 57
Sheet steel 484

Instruments

Cost factors 469
Design and operation 468
Drag-Link, for testing steering 186
Electrical
For automotive research 480
Have wide application 454
Sensitivity and accuracy of wheel 186
Some new electrical, for automotive research 444
Wheel, for steering 185
Instruments for automotive research (John A C Warner) 119, 468, 609
Insulated cable standard revised 587
Insulated Wire and Cable Sectional Committee, representatives 155

Insurance

Aviation 101
Life, in 1950 140g
International and domestic trade, Country's 647
International trade, our share of 645
Inventions, basic to come 595
Inverted engines for aircraft, advantages of 308
Investigation of motor-truck impact 21

Iron and Steel Division, S A E

Activities 148, 414
Personnel 152
Report at summer meeting 588

Isolated-Electric Lighting-Plant Division, S A E

Personnel 152
Subject assigned 296
Italy, use of electricity in 646
IVERSON, G W, ON OIL COOLING ADVOCATED FOR TRACTORS 491

J

Jacket-Water temperature, effect of 93
Job cost and performance control of motor trucks 71
Job setting and allowances 517
Joint Army and Navy Aeronautic Conference, representatives 156
Joint Committee on Investigation of Phosphorus and Sulphur in Steel, representative 156
JONES, E T, ON SUPERCHARGERS FOR AIRPLANES 400
JUDKINS, J B, ON ROLE OF THE CUSTOM BODY BUILDER 139

K

KEENAN, V E, ON PUBLIC-UTILITY EXPERIENCE WITH THE MOTORCOACH 315
KELSO, A R, ON COINING-PRESS OPERATION 510
Kerosene in tractor engines (H F Bryan) 491
KERR, GEORGE W, ON WEYMANN SILENT FLEXIBLE BODY 138, 215
KETTERING, C F, ON ENGINEER, WHAT HE HAS DONE FOR HUMANITY 567
KETTERING, C F, ON EXPERIENCES AND OBSERVATIONS ABROAD 278
KETTERING, C F, ON POWER 477
Keys and keyways, report on 496
Kick-Up and width of frame blanks 389
KIMBALL, E W, ON PRINCIPLES THAT GOVERN LUBRICATION 115
KISSINGER, MATTHEW, ON FLAT-RATE SYSTEM APPLIED TO ELECTRICAL REPAIRS 6
Knock, theories concerning 440
KRANICH, F N G, ON POWER TAKE-OFF FOR TRACTORS 491

L

Laboratory Tests

Chassis enamels 11
Wear 456
Lamp-Door, bayonet-type permitted 33
Lamp mounting, motorcoach 589
LANNEN, JOSEPH, ON ECONOMIC ASPECT OF TOOLING FOR INTERCHANGEABLE PRODUCTION 59, 225
"Layout" in factory, responsibility for 532
Leader 552
Leadership in industry, education for 402
Leather, patching perfected 143

Leather Substitute

Anchorage of film to fabric 570
Artificial aging 570
Growth of manufacture and use 569
How made 569
Quality maintained by accelerated tests 570
Scrub test 570
Tensile, tearing and fold tests 570
Leather-Substitute standard needed 569
LEDWINKA, J, ON BUILDING OF ALL-STEEL VEHICLE BODIES 125, 219
LEMAIRE, PROF PIERRE, ON AUTOMOBILE BODY SUSPENSION AND RIDING-COMFORT 560
LEMON, B J, ON GLIMPSES OF BALLOON-TIRE PROGRESS 136, 172, 626

Length of service and employment in factory 530
Less-Than-Carload freight 65
LETZ, L H, ON TRACTOR BELT-SPEEDS 491
LEWIS, B F, ON DIE-CASTING 397

License-Plate

Bracket-slots proposed 38
Standard proposed 264
Life insurance in 1950 140g

Lighting Division, S A E

Personnel 152
Report
Annual meeting 33, 40, 157
Summer meeting 589
Limiting factors of aircraft engine design 619
Limits of accuracy and tolerances 512
Lining pressures, clutch 10
Linseed oil has little effect on drying 524
Load required to break gear teeth 542
Locating and gage points 515
Loudness evaluator 381
Low-Pressures in balloon tires, factors accompanying 342
LOWE, E F, ON ENGINE GOVERNORS 116

Lubricants

Function as piston seal 118
Function of 77
Mechanical friction as affected by 77

Lubricants Division, S A E

Activities 146, 266
Personnel 153, 537

Lubrication

Boundary 471
Central-Point chassis 278, 335
Crankcase-Oil dilution and 116
Engine 562
Engine-Cylinder 112
Gasoline engines 479
Pressure feed to cylinder-wall 479
Principles that govern 115
Universal-Joints and brake linkage 340
Lubrication (H L Horning) 563
Lubrication and crankcase-oil dilution (S W Sparrow) 116
Lubrication of gasoline engines (H L Horning) 479
Lubricator, construction of pump and 338

M

McCLINTOCK, DR MILLER, ON TRAFFIC CONGESTION AND ITS RELIEF 488
McCook Field, Dayton Section inspects 568
McDONALD, J. F, ON TRAINING REPAIR SHOP PERSONNEL 556
McWANE, R C, ON ENGINE RECONDITIONING 554
MacCOULL, NEIL, ON ENGINE-CYLINDER LUBRICATION 112
MacCOULL, NEIL, ON FUEL UTILIZATION AND LUBRICATION PROBLEMS 5
Machine-Tool Safety Code Sectional Committee, representative 155
Machinery, skill in moving 85

Machines

Belt-Shifter forks 529
Breakdowns and their causes 528
Magneto 307
Magneto or battery ignition in aircraft engines 307
Maiden Detroit airplane 212

Maintenance

Compartment trucks for pipe fittings 85
Fabricating shop 83
Facilities for motor-truck 67
Highway expenditures and 467
Motor-Vehicle 57
Netting for safety 85
Operation and, of the motorbus 316
Organizing for plant work 527
Parts of motorbus 348
Periodic overhaul and, of machines 530
Practice at Ford plant 82, 527
Service and firemen 84
Skill in moving machinery 85
Special equipment 84
System for controlling motorbus 345
Maintenance department 607
Maintenance equipment show, reviewed 553
Maintenance practice at Ford plant (E E Remington) 82, 527
Making a success of flat-rates and piecework (William G Gow) 555
Making clutches thermally efficient 9
Making the service department pay (C E Gambill) 556

Management

Making whole men by education (Dr A E Morgan) 111
Element of 605
Influence of F W Taylor 605
Of motor-truck haulage 63
Service-Station 553
MANOR, E R, ON AUTOMOTIVE RAILROAD CARS 401
Manufacture of plate glass for automobile uses (J H Fox) 464
Manufacturer's agent in automotive industry 396
Manufactures for 1923, census of 354
Manufacturing committee of motor-truck organization 372
Market for standard parts in Europe 145
MASURY, A F, ON TREND OF LARGE COMMERCIAL VEHICLE DESIGN 15

Materials

Mechanical tests and composition requirements 380
Specifying performance requirements 379

Mathematical Analysis

Of impact 430
Of "tramping" 624
Measure, standards of 580
Measurement of engine vibration phenomena (C E Summers) 131, 163, 639
Measurement of sound 380
Measuring fuel consumption by weight 610
Measuring the percentage of crankcase-oil dilution (T S Sligh, Jr) 355
Mechanical friction as affected by the lubricant (L H Pomeroy) 77

Meetings

American Petroleum Institute 4
Automotive Service
Program 490
Reviewed 553
Council, S A E
December, 1924 81
January, 1925 156
February 296
April 537
Standards Committee, S A E 157
Summer, program 558
Tentative program for summer 488
Tractor reviewed 490

Meetings Committee, S A E

Personnel 156
Report at annual meeting 127

Membership Committee, S A E

Personnel 156
Report at annual meeting 126
Metal airplanes (W B Stout) 125, 209
Metal versus wood for airplanes 211
Metal-Workers' progress paved the way for metal automobile bodies 220
Mettallurgy of bearings (L A Danse) 554
Metallurgy of steel, production and 482
Methods of Expressing Limits and Tolerances Committee, S A E, personnel 154
Metric-Type thrust ball-bearings 145
MICHAUD, L P, ON ADVANTAGES OF DIFFERENT VOLTAGE ELECTRICAL SYSTEMS FOR MOTORBUSES 280
Microphotographs show defects in steel 482
MIDGLEY, THOMAS, JR, ON TETRA-ETHYL-LEAD HAZARDS 5
Mileage records of motorbuses 346
MILLER, P V, ON TOOL DESIGNING FOR PRODUCTION MANUFACTURING 513
MILLS, J F, ON SERVICE-STATION MANAGEMENT AND CONTROL 553
Mineral or vegetable fuels 546
Modern development of the medium-speed Diesel engine (N J Murphy) 11
Modern high-speed marine engines (L M Woolson) 274
Molded facing resists heat better than woven type 8

Molybdenum Steels

Approved 414
Four proposed 588
MORGAN, DR A E, ADDRESS 111
MOSS, DR SANFORD, ON AIRPLANE SUPERCHARGERS 13
MOSS, F A, ON PERSONAL EQUATION IN AUTOMOBILE DRIVING 269, 415
Motion analysis 469
Motion-Picture methods 469

Motorboat Division, S A E

Personnel 153
Report at summer meeting 589

Motorbuses

Advantages of different voltage electrical systems for 280
Cost of tires 347
Developments in body design 310
Filling stations 349
Four operating divisions 346
Gasoline consumption 351
Involuntary delays 353
Maintenance of parts 348
Mileage records 346
Night force 350
Oil consumption 352
Operation and maintenance of the 316
Standard voltage systems compared 281
System for controlling maintenance 345
Traffic congestion, can, relieve 488
Motorcoach Committee, S A E, activities 28

Motorcoach Division, S A E

Activities 409
Personnel 153, 537
Report at summer meeting 589

Motorcoaches

Lamp mounting 589
New Jersey regulations issued 28
New Jersey specifications 45
Nomenclature 409, 590
Public-Utility experience with the 315
Specifications for general construction and equipment of single-deck city-type 409
Specifications proposed 589
Tractor semi-trailer 16
Motorcycle Division, S A E, personnel 153
Motor Rail-Cars (James W Cain) 312
Motorship Raby Castle 608
Motorships 443
Motor-Truck legislation (William F Williams) 7

Motor Trucks

Anti-Skid chains, use discouraged 8
Brakes, recommendations for 20
Comfortable seats, plea for 393
Commercialized haulage 62
Control 69
Cost of freight transportation by six-wheel 430
Cost of operation and the economic life of 274

Motor Trucks (Concluded)
Cost system 70
Drivers 68
Economy of operation of six-wheel 430
Eight-Wheel 16
Field service-inspections 373
Five standard batteries recommended 38
Fuel consumption decreases with age 537
Gasoline consumption for 100 miles 430
Gasoline-Electric type 16
General control 70
Impact-Tests 23
Inspection system 67
Investigation of impact 21
Job cost and performance control 71
Legislation 7
Letters from users 375
Maintenance facilities for haulage 67
Manufacturing committee of organization 372
Multi-Wheel, advantages of 15
Observations of a superintendent of fleet-operation 534
Omission of differential 15
Operating organization 70
Repair orders and routine 68
Reports on, in service 374
Service-Department organization 372
Shop control 68
Shows 7
Six-Wheel 16
Six-Wheel-Construction advantages 429
Six-Wheel construction and operation 114, 427
Steering of six-wheel 432
Storage-Battery specifications 39
Testing chassis before shipment 373
Trailers and demountable bodies for transportation 313
Unsprung weight, effect of 428
Utilizing service-records 372
Value of field reports 374
When does, become obsolete 601
Motor-Vehicle Lighting Sectional Committee, representatives 296

Motor Vehicles
Airbrakes 283, 390, 399
All-steel bodies, building 391
Best location for carbureter intake 501
Causes of accidents 12
Economy of street space 16
Inspection and maintenance 57
Many varied types used by public service utility companies 486
Multi-Wheel 15
Public service utility companies want in, what 486
Requirements of a power and light company 487
Sahara Desert experiments 15
Some notes on automobile stages in California 321
Special requirements in public service utility field 486
Trend of large commercial 15
Weight data primarily for road design 8

Motors
Inspection in factory 531
Protection 531
MOUGEY, H C, ON AUTOMOBILE FINISHES 277
MOUGEY, H C, ON FINISHING OF AUTOMOBILES 11
Moving-Cathode tank for nickel-plating 88
Moving machinery, skill in 85
Multi-Wheel vehicles (A W S Herrington) 15
Multiple coin-pressing 511
MURPHY, N J, ON MODERN DEVELOPMENT OF MEDIUM-SPEED DIESEL ENGINE 11

N

National directory of specifications 411
National Screw Thread Commission, representatives 156
Nation's wealth 329
Natural phenomena, explanation of 646
Naval aeronautics, development in 361
Netting for safety in automobile plant 85
New Jersey motorcoach regulations issued 28
New way to evaluate dilution (T S Sligh, Jr) 140b
Next war 101

Nickel-Plating
Anode wear, compensation for 87
Cleaning before salt spray test, importance of thorough 86
Equipment, improvements in 87
Improved methods 86
Moving-Cathode tank 88
Process of 87
Sludge in tanks 88
NICKELL, A C, JR, ON CAM-OPERATED GEAR-SHIFTS 390
Night flyers 381

Nitro-Cellulose
Durability 277
Lengthens life of varnish 278
Refinishing 481
Speed of application 278
Noise evaluator described by Firestone 121

Noises
Attributed to balloon tires 179
d imeter detection of 629
Device that measures sustained 451
Elimination of 627
Study of 470
Tracing, to moving parts 449
Nomenclature Division, S A E, personnel 153
Nomenclature, motorcoach 409, 590

Non-Ferrous Metals Division, S A E
Personnel 153
Report at annual meeting 40
NORTON, S V, ON UTILIZING MOTOR-TRUCK SERVICE-RECORDS 372
Number and life of cars 150
Numbering of Steels Sectional Committee, representatives 155, 296
Numbers, use of preferred 140h

O

Observations of a superintendent of motor-truck fleet-operation (J F Winchester) 534

Officers
Metropolitan Section election 483
New England Section election 482
S A E, elected for 1925 112, 197
Washington Section election 485
Officers of the Society 197
Oil Consumption not the same 253
Oil cooling advocated for tractors (G W Iverson) 491

Oil Flow
Drip-Plugs control 336
Rate of 337
Oil-Type and dry-type cleaners show high efficiency 140a
Oil-Wells in California, pumping deep 646

Oils
Carbon-content 232
Carried from frame to axles, how 340
Consumption by motorbuses 352
Crankcase lubrication 116
Distribution to steering-mechanism bearings and spring-shackles 340
Engines affect, how 400
Engines for, versus oil for engines 5, 77
Experiments and results 241
Fatty acids improve mineral 480
Foreign material in used, its character and effect on engine design 140b, 232
Function as piston seal 118
Glass bushing shows movement 480
Importance of clean 236
Over-Production 5
Passes piston-rings, how 113
Pour-Test may not indicate cold properties 117
Results from other samples 234
Road dust may be detected, how 233
Specifications, present S A E, indicative of suitability, not quality 146
Standard to be more restrictive 266
Operation and maintenance of the motorbus (J B Stewart, Jr) 316
Organization of cooperative work of street and highway safety 58
Organizing for plant maintenance work (L A Blackburn) 527

Oscillograph
Bibliography 455
Description 455
Our share of international trade 645
Overtime 521

P

Paint drying-room, effect of preservative coatings in the 523

Painting
Finishing automobiles and 261
Production precautions for chassis 11
Pan-American standardization 405

Pan-American Standardization Conference
Delegations of the institutions of Peru 406
Final act of 407
Official delegates 406
Papers presented 406
Report of K K Hoagg 405
Unofficial delegates from United States 406
Panels formed in one piece, closed-body 222

Parts
Analysis of, returned from the field 377
Eliminate synchronous vibration of 393
Failure through fatigue 541
Few errors in orders 537
Maintenance of motorbus 348
Market for standard, in Europe 145
Quantity and tolerances 59
Requires 24-hr service on 535
Rolling stock preferable to stock 535
Study of disbursements 377

Parts and Fittings Division, S A E
Activities 496
Personnel 153
Report
Annual meeting 34, 38, 159
Summer meeting 591

Passenger-Car Body Division, S A E
Personnel 153, 296
Report at annual meeting 41, 158
Passenger Car Division, S A E, personnel 153, 537
Patching of leather perfected 143
Patents Committee, S A E, personnel 154
PATERSON, JAMES, ON SMALL-CONSIGNMENT COMMODITY-DISTRIBUTION IN LONDON AND ITS ENVIRONS 326
PATRICK, MAJOR-GEN MASON M, ON AIRCRAFT FOR DEFENSE 568
Patrolmen and firemen at automobile plant 84
Pedal, clutch, pressures 10
PERKINS, H G, ON GROUP WAGE-PAYMENT PLAN 516
Personal equation in automobile driving (F A Moss and H H Allen) 269, 415
Personal equation in service profits (Howard A Coffin) 553
Peruvian petroleum 191

Petroleum
Peruvian 191
Quality and prices 478
Should present quality be changed? 479
Some aspects of situation 478

Petroleum Products and Lubricants Committee

Activities 497
Personnel 497

PHILIPP, OTTO, ON AGRICULTURAL MACHINERY ENGINEERING, DEVELOPMENT AND RESEARCH IN GERMANY 490

PHILLIPS, W M, ON DURABILITY OF PLATED SURFACES 73

Physical and mental impressions of riding-qualities at odds 392

Physical characteristics of road and of field dust (C E Summers) 140, 243, 630

Piecework, making a success of flat-rates and 555

PIERCE, H T, ON FLAT-RATE SERVICE-SYSTEMS 394

Piezo-Electric Effects

Bibliography on 455
Use of, in vibration detector 450

Pinions and ring-gears, rear-axle 543

Pipe fittings, compartment trucks for 85

Pipe Flanges and Fittings Sectional Committee, representative 155

Piston Pin

Bushing and, practice, proposed 494
Diameters to be limited 588

Piston-Rings, oil passes, how 113

Pistons

Growth of 253
Wear 276

Pitch and toe-in effects 628

Place of service in industry (E V Rickenbacker) 554

Plain Limit Gages Sectional Committee, representatives 155

Planning department of recent origin 604

Plants and equipment for motor-truck haulage 62

Plate glass for automobile use, manufacture of 464

Plated surfaces, durability of 73

Plating of die-castings 397

PLEASANTON, F R, ON SHEET STEEL INSPECTION 484

Pneumatic-Tire elements and development (L J D Healy) 421

POMEROY, L H, ON MECHANICAL FRICTION AS AFFECTED BY THE LUBRICANT 77

Poppet-Valves

Proposed new standard 494
Standard revised 588

Possible economies in automotive machine-shop operations (A L DeLeeuw) 460

Possible improvements in passenger-car design (Herbert Chase) 275, 484

Possibilities of hydraulic steering (J W White) 566

Power

Economy of present-day passenger-automobile 102
Other costs in factory and 532

Power (C F Kettering) 477

Power alcohol from tubers and roots 546

Power and gasoline economy of present-day passenger-automobile (A A Straub) 102

POWER, EUGENE, ON COST OF OPERATION AND THE ECONOMIC LIFE OF A MOTOR TRUCK 274

Power take-off for tractors (F N G Kranich) 491

Power take-off, tractor 49, 491

Preferred Numbers, Special American Engineering Standards Committee on

Activities 413
Representatives 155

Preferred numbers, use of 140h

Preignition knocks and carbon deposits 104

Preplanning, importance of 605

Pre-Selective automatic shift (J S Alspaugh) 390

Preservative coatings in the paint drying-room, effect of 523

Pressure feed to cylinder-wall 479

Pressure indicator for long runs 611

Pressure systems, temperature raised by 636

Pressures

Clutch pedal and lining 10
Recommended for balloon tires 497
Recording indicator for cylinder 444

Prevention of shimmying (R B Day) 136, 192

Prevention of waste, utilization and 223

Prices

Automobiles, in Germany 61
Petroleum 478

Principles of steam-cooling systems (N S Diamant) 330, 632

Principles that govern lubrication (E W Kimball) 115

PRINZ, C D, ON SERVICE PROBLEMS CONFRONTING THE DISTRIBUTER AND THE DEALER 6

Problems of the body builder 221

Production

Airplanes, quantity 209
Brains of 271, 604
Connecting-Rods 488
Cost here and abroad 182
Economic aspect of tooling for interchangeable 59
Estimate of 606
Flow layouts 606
Importance of preplanning 605
Planning department of recent origin 604
Tool 61
Tool designing for manufacturing 513

Production and metallurgy of steel (L A Danse) 482

Production meeting, S A E, announced 267

Production of connecting-rods (R C Barron, Eugene Bouton, H O Schultz, N R Wells and John Younger) 488

Production precautions for chassis painting 11

Progress of civil aviation 52

Propeller-Shaft

Flexible-disc standard recommended 38
Standard not used 263

Psychology of automobile driving (H H Allen and F A Moss) 269

Public-Utility experience with the motor-coach (V E Keenan) 315

Publication Committee, S A E, personnel 156

PULSIFER, L VALENTINE, ON DURABILITY OF NITRO-CELLULOSE 277

Pump, construction of lubricator and 338

Pumping deep oil-wells in California 646

Pumps in aircraft engine 124

Punctures

Bruises of tires and 178
Front tires less susceptible to 344

Pyramidal form of distribution in automotive industry 396

Pyroxylin finishes (R P Thayer and R C Williams) 118

Pyroxylin type, finishing-material of the 481

Q

Quality of petroleum 478

Quality, should present, of petroleum be changed 479

Quantity and standardization 605

R

Raby Castle, motorship 608

Radial engines 594

Radiator Cores

Bronze the best material 561
Construction 561

Radiator cores and construction (F M Young) 561

Radiator Division, S A E, personnel 153

Radiators

Air-Temperature rise in 261
Cores and construction 561
Efficient as condenser, more 639
Steam-Cooling system with, in series with jackets 332

Rail and highway 547

Railroad-Car, gasoline, for branch lines 318

Railroad operations 432

Railroad transportation development 2

Railroads

Automotive cars 401
Gasoline cars for branch lines 318
Operations 432
Shrinkage of passenger-traffic 403
Transportation development 2

Reaction-Time

Age, effect of, on 419
Average 416
General intelligence, relation of, to 419
Results, application of 419
Sex, effect of, on 419
Speed and 418
Training, effect of, on 418
Variability 416

Reactions in steering-knuckle 541

Rear Axle

Driving-Shafts 543
Pinions and ring-gears 543

Recent cooperative-fuel-research progress (S W Sparrow and J O Eisinger) 140c, 237

Recent developments in aircraft engines (L M Woolson) 122, 297, 617

Recent developments in production methods and equipment (Max Sklovsky) 491

Recent progress in various fields of automotive engineering (H L Horning) 401

Reconstruction of devastated France 76

Recording indicator for cylinder pressures 444

REEMELIN, O B, ON SPECIAL REQUIREMENTS OF MOTOR VEHICLES IN PUBLIC SERVICE UTILITY FIELD 486

Refinishing automobiles, preparation for 481

Remedies for crankcase-oil dilution 100

REMINGTON, E E, ON MAINTENANCE PRACTICE AT FORD PLANT 82, 527

Rental plan should include overhead in fleet operation 536

Repainting used cars to increase their salability (L C Hill) 556

Repair orders and routine for motor trucks 68

Repairs in factory, analysis and making 528

Reparation question, light on 486

Reporting and investigation of accidents 54

Reports

Annual meeting, S A E 119
Automotive Service Meeting, S A E 553
Hoagg, Kirke K, on Pan-American Standardization Conference 405
Meetings Committee, S A E 127
Membership Committee, S A E 126
Motor-Truck service, analysis of 375
Motor trucks in service 374
Sections Committee, S A E 128
Service-Manager's 378
Standards Committee, S A E 33, 131
Standards Committee, S A E, division at summer meeting 581
Statistics of accidents 55
Tractor Meeting, S A E 490
Treasurer 128
Value of field 374

Research

Active interest and, needed in steam-cooling systems 334
Agricultural machinery engineering, development and 490
Attitude of business toward sound 404
Connecting-Rod design, application to 404
Design requirements for instruments 120
Direction and scope of fuel 237
Electrical instruments for automotive, some new 444, 480

Research (Concluded)
Fuels 161
Gears 162
Highways 161
Highway, pays 22
How loud is loud 120
Inquisitive mind 262
Instruments and apparatus 119
Instruments for automotive 119, 468, 609
Justification for highway 23
Motion study 120
Nation's greatest asset 404
Noise evaluator described by Firestone 121
Recent cooperative fuel progress 140c
Rough-And-Ready devices 120
Tractor 490
Tractor engines 491

Research Committee, S A E
Fuels Group personnel 162
Personnel 162
Riding-Qualities Group, personnel 162

Research Department
Information service 162
Travel 162
Research on tractor engines (H L Horning) 491
Research, the Nation's greatest asset 404
Responsibility for "layout" in factory 532
Resume of annual meeting (John Younger) 268
Reversed and multiple-leaf springs 230
Reversing the shackles 229
RHODES, F L, ON INDUSTRIAL STANDARDIZATION 379
RICHARDSON, COM H C, ON DEVELOPMENT IN NAVAL AERONAUTICS 361
RICKENBACKER, E V, ON PLACE OF SERVICE IN INDUSTRY 554
Riding and walking, comparative risk 52
Riding-Comfort, automobile body suspension and 560
Riding-Qualities Group of Research Committee, personnel 162

Riding-Qualities
Bibliography 162, 261
Eliminate synchronous vibration of parts 393
Individuals disagree as to comfort 392
Investigation 161
Measurements 571
Physical and mental impressions at odds 392
Receiving study by Bureau of Standards 13
Shock-Absorbing devices 10
RILEY, J J, ON FINISHING-MATERIAL OF THE PYROXYLIN TYPE 481

Rims
Drop-Center 136
Width for balloon tires 174
Ring-Gears, rear-axle pinions and 543
Rivets, subdivision on brake-lining, appointed 496
Road and riding ability (H L Horning) 392
Road shock, prevention of wheel wabble and 194
Road-Tests of transmission gears 542

Roads and Highways
Causes of failures 428
City planning and zoning 55
Conduct of drivers and pedestrians 57
Construction 56
Crossing of a crowned, chart of the 188
Dust may be detected, how 233
Expenditures and maintenance 467
Grade crossings 54
Justification for research 23
Maximum lane capacity 270
Performance 103
Periodic forces between tires and 189
Physical characteristics of dust 140, 243, 630
Rail and 547
Research 161
Research pays 22
Safety 53
Six-Wheel trucks and their effect on 114
Surface, effect on brakes 20
Traffic analysis 23
Transportation cost element 22
Weight data of motor vehicles primarily for design 8
Rochelle salt-crystal vibration detector 450
Role of the custom body builder (J B Judkins) 139
Rolling stock preferable to parts stock 535
Roots and tubers, power alcohol from 546

Rotor-Ship
Ease of control 600
Flettner 599
ROUND, G A, ON FOREIGN MATERIAL IN USED OIL; ITS CHARACTER AND EFFECT ON ENGINE DESIGN 140b, 232
Rubber 105

Rubber
Crankshaft 3
Smoked ribbed sheet and pale crepe 421
Sulphur, action of 422
Rubber shock-insulators 622
RUDOLPH, F P, ON FLAT-RATE SERVICE-SYSTEMS 394
Russia, standardization in 143

S

S A E
Annual dinner 111
Annual Meeting
Announced 3
Carnival 4, 139
Program 4
Reviewed 119
Automotive Service Meeting
Announced 490
Reviewed 553
Council Meetings
December, 1924 81
January, 1925 156
February 296
April 537
Data Sheets 413
Exhibit at Cleveland Automobile Show 118
Officers for 1925 197
Officers for 1925 elected 112
Summer Meeting
Announced 268
Program 558
Tractor Meeting
Announced 267
Program 387
Reviewed 490

Safety
Aeronautical code 493
Airplane 210
Automobile brakes and brake testing code 23
Comparative risk of riding and walking 52
Education in 57
Education in schools and provision of playgrounds 55
Engineering 533
Netting 85
Organization of cooperative work 58
Program of future activities 58
Responsibility for education in factory 529
Street and highway 53
Tentative code 23

Safety Code
Aeronautical 493
Automobile brakes and brake testing 23
Tentative 19
Sales analysis 606
Sales, financing car 580
Sales resistance in motor-truck haulage 64
Salvage, tool 458
Saturation-Point for motor cars pushed ahead to 27,000,000 (Col Leonard P Ayres) 111, 195

Saving
Belt-Cutting at automobile plant 91
Set-Up time of frames 388
SCHLESINGER, DR H I, ON VELOCITY OF CHEMICAL REACTIONS AND CATALYSIS 433
SCHULTZ, H O, ON PRODUCTION OF CONNECTING-RODS 488
SCHWAB, CHARLES M, ON BUSINESS AND OPTIMISM 568
SCHWAB, L M, ON STANDARDIZATION OF FRAMES 388
SCHWEITZER, PAUL H, ON ANOTHER ASPECT OF CRANKCASE-OIL DILUTION 92
SCOTT, JOSEPH, ON COST OF OPERATION AND THE ECONOMIC LIFE OF A MOTOR TRUCK 274
SCOTT, PHILIP L, ON DESIGN OF DIESEL ENGINES 483

Screw Threads
Designations, new 410
Extra-Fine thread fit applications 592
Extra-Fine thread fits recommended 592
Fits recommended 34
Tap-Drill reference tables 42

Screw Threads Division, S A E
Activities 412
Personnel 153
Report
Annual meeting 33, 34, 42, 158
Summer meeting 592
Screw Threads Sectional Committee, representatives 155
Seats, plea for comfortable motor truck 393
Secretaries of Sections, new 16

Sectional Committees
Aeronautical Safety Code, representatives 154
Automobile Headlighting Specifications, representatives 154
Ball Bearings, representatives 155
Bolt, Nut and Rivet Proportions,
Report 145
Representatives 155
Brakes and Brake Testing, representatives 155
Code on Colors for Traffic Signals, representative 155
Gears, representatives 81, 155
Insulated Wire and Cable, representatives 155
Machine-Tool Safety Code, representative 155
Motor-Vehicle Lighting, representatives 296
Numbering of Steels, representatives 155, 296
Pipe Flanges and Fittings, representative 155
Plain Limit Gages, representatives 155
Safety Code for Automobile Brakes and Brake Testing
Action of 21
Representatives 81
Screw Threads, representatives 155
Specifications for Zinc Coating of Iron and Steel, representatives 156
Standardization of Transmission Chains and Sprockets, representatives 156
Use, Care and Protection of Abrasive Wheels, representative 155

Sections, S A E
Dinner at Indianapolis 485, 567
McCook Field inspected by Dayton 568
Metropolitan, election of officers 483
New England, election of officers 482
Officers for 1925 elected 565
Outing of Cleveland 568
Pennsylvania and Metropolitan visit Lakehurst 567
Secretaries, new 16
Southern California formed 563
Washington, election of officers 485

Sections Committee, S A E
Activities 140f
Personnel 156
Report at annual meeting 128
Seismograph and accelerometer, difference between 571

Service
Analysis of reports 375
Complaint file 376
Factory conferences 376
Factory road-men 376
Field inspections 373
Field meetings 377
Flat-Rate system applied to electrical repairs 6
Flat-Rate systems 394
Flat-Rates advocated 554
In industry 554
Making department pay 556
Personal equation in profits 553
Prices to include labor and material 394
Problems confronting the distributer and dealer 6
Reports on motor trucks in 374
Requires 24-hr on parts 535
Training repair shop personnel 556
Utilizing motor-truck, records 372
Value of field reports 374
Service-Department organization 372

Service Meeting
Announced 267
Reviewed 553
Service problems confronting the distributer and the dealer (C D Prinz) 6

Service-Station
Management and control 553
Results of adjustment of automobiles 103
Service-Station management and control (J E Mills) 553
Shackles, reversing the 229
Shafts, design of 544
Sheet steel inspection (F R Pleasanton) 484
SHEPARD, R L, ON DIE-CASTING 397
SHERMAN, RAY W, ON AUTOMOBILE MERCHANDISING SYSTEMS 396
Shims not used in manufacture or assembling of connecting-rods 488
Shock-Absorbers (W B Groves) 401
Shock-Absorbing devices (Leighton Dunning) 10
Shock-Insulators, rubber 622
Shop control of motor trucks 68
Shrinkage of railroad passenger-traffic 403
Side wall of tires 423
Simple and compound spring-systems 626
Six versus four-ply balloon tires 343
Six-Wheel truck construction and operation (E Favary) 114, 427, 487
SJOGREN, O W, ON TRACTOR RESEARCH 490
SKINNER, A A, ON VOLTAGE REGULATION 280
SKLOVSKY, MAX, ON RECENT DEVELOPMENTS IN PRODUCTION METHODS AND EQUIPMENT 491
SLIGH, T S, JR, ON CRANKCASE-OIL DILUTION, ITS CAUSES AND MEASUREMENT 398
SLIGH, T S, JR, ON MEASURING THE PERCENTAGE OF CRANKCASE-OIL DILUTION 355
Sludge in tanks for nickel-plating 88
Small-Consignment commodity-distribution in London and its environs (James Paterson) 326
Smoked ribbed sheet and pale crepe rubber 421
Some aspects of the petroleum situation (J D Gill) 478
Some new electrical instruments for automotive research (J H Hunt and G F Embshoff) 282, 444
Some notes on automobile stages in California (F D Howell) 321

Sound
Attributed to balloon tires 179
Bibliography on transmission of 455
Measurement of 380

Southern California Section
Formed 563
Officers installed 563

Spark-Plugs
Minimum clearance of 3 in necessary 411
Recommendations 494
SPARROW, S W, ON BUREAU OF STANDARDS WORK 13
SPARROW, S W, ON CRANKCASE-OIL DILUTION, ITS CAUSES AND MEASUREMENT 398
SPARROW, S W, ON LUBRICATION AND CRANKCASE-OIL DILUTION 116
SPARROW, S W, ON RECENT COOPERATIVE-FUEL-RESEARCH PROGRESS 140c, 237
Specific gravity, separation of distillate by 356
Special requirements of motor vehicles in public service utility field (O B Reemelin) 486

Specifications
Body, English patent 216
Coin-Press capacity 511
Crankcase lubricating oil 266
Motorcoach, for general construction and equipment of single-deck city-type 409
Motorcoach, New Jersey 45
Motorcoach, proposed 589
National directory of 411
Oil, present, S A E, indicative of suitability, not quality 146
Storage-Batteries 39
Tractor rating 585
Specifications for Zinc Coating of Iron and Steel Sectional Committee, representatives 156
Specifying performance requirements of materials 379

Speed
Automobile 54
Nitro-Cellulose application 278
Reaction-Time, effect of, on 418
Tractor belt 491
Spring-Shackles, distribution of oil to steering-mechanism bearings and 340
Spring-Suspension 276
Spring-Systems, simple and compound 626
Springs (D R Swinton) 10

Springs
Balloon tires, effect of 10
Blocking front, prevents wheel shimmy 135
Blocking the 228
Calculation and design of coil 492
Multiple-Leaf 230
Reversed 230
Stiffness versus inflation-pressure 190
Springs Division, S A E, personnel 154
Stages, some notes on automobile, in California 321
Standardization 545, 645

Standardization
Compression-Type fittings proposed 34
Differentials proposed 36
Door-Hinge, recommended 41
Flexibility necessary in 380
Frames 388
Gaging nut slots, method proposed 33
Germany 144
Head-Lamp, revised 40
Industrial 379
Leather-Substitute needed 569
License-Plate, proposed 264
Maintenance methods 82
Methods for maintenance 82
Motor-Truck haulage 67
Near 645
Oil, to be more restrictive 266
Pan-American Conference 405
Propeller-Shaft flexible-disc, recommended 38
Propeller-Shaft, not used 263
Quantity and 605
Russia 143
Screw-Thread fits recommended 34
Tap-Drill, recommended 42
Tire 629
Standardization in Russia 143
Standardization of frames (L M Schwab) 388
Standardization of Transmission Chains and Sprockets Sectional Committee, representatives 156

Standardization Policy Committee, S A E
Activities 264
Personnel 154

Standards
Army-Navy
Adopted to date 411
Approved 582
Cancelled 587
Needed 497
Insulated cable revised 587
Manufacturers' frame dimensions 389
Measure 580
Poppet-Valve revised 588
Clutch Bearing
Requisite nature of 379
Results of letter ballot on adoption of 413

Standards Committee, S A E
Annual meeting 157
Attendance at annual meeting 160
Division Reports
Annual meeting 33
Summer meeting 581
Personnel 151
Report at annual meeting 131
Standards Committee Division reports 33, 581
Standards of measure 580
Static load-tests of concrete slabs 23
Stationary Engine Division, S A E, personnel 154
Statistics and reports of accidents 55
Status of British industry 76
Steam-Chests below jackets, operation with 332
Steam-Cooling (Alexander Herreshoff) 561
Steam-Cooling of internal-combustion engines (N S Diamant) 140e

Steam-Cooling Systems
Active interest and research needed 334
Conventional cars successfully operated 635
Ideal, maintains maximum safe temperature 634
Main elements and their disposition 331
No loss of steam 635
Operation with steam-chest below jackets 332
Practical application to present engines 634
Principles of 330, 632
Radiator in series with jackets 332
Summary of various 333
Thermosiphon system, comparison with 638
Underlying principles and after-steaming effect 334
Water-Circulation rate, effects of 334
What it accomplishes 633
Steam distillation methods of measuring crankcase-oil dilution empirical 357

Steels
Automobile design and automotive 538
Chromium-Silico-Manganese 148
Grain, effect on strength 572
Microphotographs show defects 482
Molybdenum
Approved 414
Four proposed 588
Production and metallurgy of 482
Sheet, inspection 484
Stamping, important factors 484
Testing methods 484
Steel sections have smaller area than wood 221

Steering
Conditions affecting 205
Drag-Link instrument 186
Hard, creates sales resistance 393
How hard does automobile 135, 183, 619
Hydraulic, possibilities of 566
Necessity for securing reliable data on automobile 183
Six-Wheel truck 114, 432
Variable-Point 231
Wheel instrument 185
Steering-Gear, geometry of 228

Steering-Knuckle

Reactions in 541
Stresses
In axle center and when turning a corner 540
In front axle and factor of safety 539
On spindle when springs are closed 540
Steering-Systems, analysis of 279
STERN, MARC, ON DIE-CASTING 397
STEWART, E W, ON CALCULATION AND DESIGN OF COIL SPRINGS 492
STEWART, J B, JR, ON OPERATION AND MAINTENANCE OF THE MOTORBUS 316
Stiff tread resists wheel shimmy 231
Stiffness of springs versus inflation-pressure 190
Stock records 607
Stopping-Distance, limit of 270

Storage-Batteries

Automobile 39
Automotive, its operation and care 503
Charging equipment 503
Five standard sizes recommended for trucks 38
Motor-Truck 39
Rating at 5 amp incorrect 149
Ratings 149
Ratings and capacities 594
Specifications 39
Tray terminal standard recommended 42
20-Hr rating recommended 493

Storage-Battery Division, S A E

Activities 149, 493
Personnel 154
Report
Annual meeting 38
Summer meeting 594
STOUT, W B, ON METAL AIRPLANES 125, 209
STRAUB, A A, ON POWER AND GASOLINE ECONOMY OF PRESENT-DAY PASSENGER-AUTOMOBILE 102
Street and highway safety 53

Streets

Arcaded, proposed for New York City 403
City planning and zoning 55
Construction 56

Stresses

Axle center and steering-knuckle, when turning a corner 540
Bending, in crankshaft and crankcase 169
Due to turning and to side-sway 541
Factor of safety and, in front axle 539
Front-Axle center under maximum vertical-load 539
Steering-Knuckle spindle, when springs are closed 540
STRICKLAND, W R, ON FRONT-WHEEL SHIMMYING 133, 227, 620
Stroboscopic methods 469
Structures and Fabricated Metals Committee of the Bureau of Standards, representatives 155
STURGES, E B, ON DEVELOPMENTS IN TRANSMISSION 389

Sulphur

Action of, on rubber 422
In fuels 161

Summer Meeting, S A E

Announced 268
Automobile routes 560
Hotel accommodations 268, 560
Program 558
Recreation 268
Reduced railroad rates 489
Technical sessions 268
Tentative plans 488
Tentative program 388
Train schedule 559
Transportation 560
SUMMERS, C E, ON ENGINE VIBRATION 11
SUMMERS, C E, ON MEASUREMENT OF ENGINE VIBRATION PHENOMENA 131, 163, 639
SUMMERS, C E, ON PHYSICAL CHARACTERISTICS OF ROAD AND OF FIELD DUST 140, 243, 630

Superchargers

Advantages to automotive engines 400
Airplane 13, 400
Development of automobile during 1924 595
Racing automobiles, use on 400
Superchargers for airplanes (E T Jones) 400
Support-Arm widths for engines recommended 40
Surface checks in wood in varnish-drying rooms, causes of 523
SWINTON, D R, ON SPRINGS 10
Symposium of practices in machining connecting-rods 488
Synchronized vibration 134
Synchronized vibratory motion 627
Synthetic liquid fuel 403
System for controlling motorbus maintenance (R E Fielder) 345

T

Tap-Drill reference tables 42
Telemeter as vibration detector, use of 454

Temperature

Combustion-Chamber, some 634
Engine power affected by 13
Higher, increases mechanical efficiency of engine 635
Ideal system maintains maximum safe 634
Jacket-Water, effect of, on crankcase-oil dilution 93
Raised by pressure system 636

Tests

Air-Cleaner
Methods of 246
New, since last June 370
Secondary 255
What, have covered 367
Air-Cleaners 395
Anchorage of film to fabric in leather substitute 570
Artificial aging of leather substitute 570
Calibration of apparatus 625
California, Hoffman questioned on air-cleaner 140b
Character of dust 631
Chassis, before shipment 373
Description of apparatus for driving 415
Devices for aviation, new 273
Discussions and, of wheel shimmy 228
Essentials of a satisfactory air-cleaner road 256
Final report on the 1924 California air-cleaner 140a, 367, 630
Gear, at the National Physical Laboratory 420
How laboratory, were made of air-cleaners 371
Impact
Static-Load and, of concrete slabs 23
Six-Wheel truck 430
Trucks 114
Laboratory
Air-Cleaner 371
Conditions of automobile 270
For chassis enamels 11
Wear 456
Mechanical, and composition requirements of materials 380
Methods and instruments for brake 20
Motor-Truck impact 23
Preparation of engines for 249
Quality of leather substitutes maintained by accelerated 570
Records of balloon tire 344
Results of oil 241
Road, of transmission gears 542
Safety code on automobile brakes and 23
Sahara Desert, commercial vehicles 15
Scrub, for leather substitute 570
Service, wear 456
Steel, methods for 484
Tensile, tearing and fold for leather substitutes 570
Tractor wheel-lugs 490
Tetra-Ethyl-Lead hazards (Thomas Midgley, Jr) 5
THAYER, R P, ON PYROXYLIN FINISHES 118
Thermal conductivity, new method of exhaust-gas analysis by 613
Thermodynamic principles, application of, to engine 97
Thermosiphon system, comparison with steam-cooling system 638
Thick-Wing airplanes 211
Third-Brush-Controlled generator 573
Third-Brush-Generator disadvantages 280
Throttle-Lever thread, change in 588
TIEMANN, HARRY D, ON CAUSES OF SURFACE CHECKS IN WOOD IN VARNISH-DRYING ROOMS 523
Timing-Gear and accessory-drive layout for aircraft engines 306
Tire and Rim Division, S A E, reestablished 537

Tires

Balancing 629
Beads 422
Bounces 135
Breaker fabric 423
Carcass of fabric structure 422
Causes of wear 627
Changing the body 193
Coloring of 423
Configuration of tread 176
Cord 422
Cost of motorbus 347
Cushioning properties, procedure and apparatus for measuring 21
Degrees of unbalance of 628
Friction coat 423
Future development 425
Heights and sizes 629
High air-pressure a recognized cure for wheel shimmy 227
Inflation-Pressure 177
Maintenance of sizes of 136
Periodic forces between road and 189
Pneumatic, elements and development 421
Punctures and bruises 178
Side wall 423
Sizes 173
Standardization 629
Stiff tread resists wheel shimmy 231
Stiffness of springs versus inflation-pressure 190
Tread assembly 424
Thread profile 176
Unbalance, effect of 136
Wear of tread 424
Toggles versus hydraulic press operation 511

Tolerances

Grinding fixtures and 515
Limits of accuracy and 512
Tool designing for production manufacturing (P V Miller) 513
Tool production 61
Tool salvage (L A Churgay) 458

Tooling

Economic aspect of interchangeable production 59, 225
Rules for economical 60
Tracing noise to moving parts 449
Traction of the driving wheels 428
Tractor belt-speeds (L H Letz) 491
Tractor design progress (J S Erskine) 401
Tractor ignition (L F Burger) 491
Tractor industry, early days of (A W Fitzpatrick) 490

Tractor Meeting, S A E

Announced 267
Inspection trips 387
Reviewed 490
Sessions announced 387
Speakers announced 387
Tractor research (O W Sjogren) 490
Tractor semi-trailer motorcoach 16
Tractor testing forms recommended 585
Tractor wheel-lugs tested (E V Collins) 490

Tractors

Belt speeds 491
Controversies of the development period 48
Cultivation demands 50
Design progress 401
Early days in industry 490
Engineering features 51
Engineering progress in general-purpose farm development 47
General-Purpose 50
Ignition 491
Internal-Combustion-Engine 47
Kerosene in engines 491
Oil cooling advocated 491
Power take-off for 49, 491
Rating specifications 585
Recent developments in production methods and equipment 491
Research 490
Research on engines 491
Schools 49
Testing forms recommended 585
Wheel-Lugs tested 490

Traffic

Control officers 57
Courts 54
Planning 54
Provision of facilities 55
Shrinkage of railroad passenger 403
Surveys 55
Uniformity of regulations 55

Traffic and Transportation

Can motorbuses relieve congestion 488
Cause and prevention of accidents 12
Congestion and its relief 488
Cost of freight by six-wheel truck 430
Economy of street space 16
Freight 486
Highway
Analysis 23
Cost factors 22
Laws should be uniform 12
Legislative principles 53
Penalties for violations of laws 12
Planning 647
Railroad development 2

Traffic and Transportation (Concluded)
Small-Consignment commodity distribution in London and its environs 326
Street and highway safety 53
Trailers and demountable bodies for motor 313
Traffic congestion and its relief (Dr Miller McClintock) 488
Traffic-Transportation planning 647
Trailers and demountable bodies for motor transportation (H W Howard) 313
Train schedule at summer meeting 559
Training of personnel 556
Training repair shop personnel (J F McDonald) 556
"Tramping"
Causes of and remedies for 623
Combined shimmying and 621
Mathematical analysis of 624
Transmission Division, S A E, personnel 154
Transmission gears 542
Transmission gears, road-tests 542

Transmissions
Constant-Mesh hydraulic 389
Demonstrated 389
Development in 389
Friction drive again advocated 390
TRASK, C A, ON FRICTION DRIVE TRANSMISSION 390

Tread
Assembly 424
Configuration 176
Profile 176
Stiff, resists wheel shimmy 231
Treasurer's report at annual meeting 128
Trend of large commercial-vehicle design (A F Masury) 15

Truck Division, S A E
Activities 263
Personnel 154, 296, 537

Trucks
Economy of operation of six-wheel 114
Impact tests 114
Six-Wheel 487
Six-Wheel, and their effect on the road 114
Six-Wheel, types of construction 114
Steering ability of six-wheel 114
Tube fittings, fuel and lubrication, proposed changes 496
Tubers and roots, power alcohol from 546
Tubing, cold-drawn 472

Turbulence
Effects on centrifugal cleaners 632
Prevents hot-spots, increased 637
Turning-Effects 188

U
Underlying principles and after-steaming effect 334
Underwriters' Laboratories inspected by Chicago Section 6
Unevaporated particles of fuel 99
Universal-Joints and brake linkage, oiling 340
Unsprung weight, effect of 428
Use, Care and Protection of Abrasive Wheels Sectional Committee, representative 155
Use of electricity in Italy 646
Utilization and prevention of waste (C B Auel) 223
Utilizing motor-truck service-records (S V Norton) 372

V
Vacuum always present 400
Vacuum booster brake (C S Bragg) 399
Vacuum brake, application of 399

Vacuum Distillation Transition Method
Apparatus for measuring crankcase-oil dilution 18
Measuring crankcase-oil dilution 17, 358
Operation 18
Value of 1924 farm products 600
Valve-Housing of aircraft engine 304

Valve-Springs
Aircraft engine 123
Breakage, causes of 306
Multiple-Cluster in aircraft engines 306

Vapor-Cooling System
Hot-Spots do not develop 140f
No boiling away of water 140e
No technical difficulties in the way 140f
Variable-Point steering 231
Varnish-Drying rooms, causes of surface checks in wood in 523
Varnish, nitro-cellulose lengths life of 278

Velocity
Chemical reaction, and catalysis 433
Dixon's studies of reaction 439
Factors determining reaction 434
Wind, on rotating cylinder, effect of 599
Velocity of chemical reactions and catalysis (Dr H I Schlesinger) 433
Vibration recorder demonstrated 380

Vibrations
Detector for registering torsional 445
Eliminate synchronous, of parts 393
Engine 11
Engine, measurement of 131, 163, 639
Measuring air, simpler device for 452
New instrument makes records of engine 165
Rigidity and weight determine period 170
Rochelle salt-crystal detector 450
Synchronized 134
Torsional is recorded, how 167
Voltage-Regulated system 575

Voltage-Regulated Systems
Regulator 281
Summary of advantages 579
Third-Brush-Controlled generator 573
Third-Brush-Generator disadvantages 280
Voltage regulation 574
Voltage regulation, how it is effected 281
Voltage regulation of automotive electrical systems (Dale S Cole) 280, 573
Voltage regulator 281, 576
Voltage systems, standard motorbus, compared. 281

W
WADE, LIEUT LEIGH, ON AROUND THE WORLD FLIGHT 485
Wage-Payment, group-bonus 61

Wages
Equalization of 518
Germany 61
WAGNER, L, ON HOW ENGINES AFFECT OILS 400
Walking and riding, comparative risk of 52
War, next 101
WARNER, JOHN A C, ON INSTRUMENTS FOR AUTOMOTIVE RESEARCH 119, 468, 609
WASSON, *R B*, ON APRAISING CARS BY COMPARISON OF MECHANICAL EFFICIENCY 563
Water, combustion-chamber covered by 639
Water-Soluble contents of woods 526
Wealth, Nation's 329

Wear
Causes of tire 627
Laboratory tests 456
Tread of tires 424

Weight
Data on motor vehicles primarily for road design 8
Measuring fuel consumption by 610
WELLS, N R, ON PRODUCTION OF CONNECTING-RODS 488
WEMP, E E, ON DEVELOPMENT OF AUTOMOTIVE CLUTCHES 8, 562
Weymann silent flexible body (George W Kerr) 138, 215
What public service utility companies want in motor vehicles (J F Casserly and O B Reemelin) 486
Wheel-Lugs, tractor, tested 490

Wheel Shimmy
Alternating forces affect 191
Balloon tire causes 181
Blocking the front springs prevents 135
Caster angle 230
Causes 133, 207
Changing tire body to prevent 193
Combined "tramping" and 621
Front 133, 227, 620
High air-pressure a recognized cure 227
Hydraulic check 230
Its causes and cure 134, 189, 619
Mechanical means of correction 193
Perfect geometry determination 229
Prevention of 136, 192
Remedies for 137
Remedy, other means of 625
Results of using stiffer front-springs 624
Road shock and, prevention of 194
Rubber shock-insulators 622
Session at annual meeting 3, 133
Stiff tread resists 231
Tests and discussions 228
Tramping and 134
Wheel shimmying, its causes and cure (O M Burkhardt) 134, 189, 354, 619

Wheels
Anti-Skid chains, use discouraged on motor truck 8
Generation of accelerating forces 628
Instrument for testing steering 185
Pitch and toe-in effects 628
Sensitivity and accuracy of instrument 186
Traction of driving 428
When does a motor-truck become obsolete? (F W Davis) 601
WHITE, J W, ON EFFECTS OF BALLOON TIRES ON CAR DESIGN 205, 620
WHITE, J W, ON POSSIBILITIES OF HYDRAULIC STEERING 566
WHITE, S O, ON CONSTANT-MESH HYDRAULIC TRANSMISSION 389
WICKENDEN, THOMAS H, ON AUTOMOBILE DESIGN AND AUTOMOTIVE STEELS 538
WILLIAMS, R C, ON PYROXYLIN FINISHES 118
WILLIAMS, WILLIAM F, ON MOTOR-TRUCK LEGISLATION 7
WINCHESTER, J F, ON OBSERVATIONS OF A SUPERINTENDENT OF MOTOR-TRUCK FLEET-OPERATION 534

Wind
Direction of resultant force and 599
Velocity of rotating cylinder, effect of 599
Wind velocity on rotating cylinder, effect of 599

Wood
Bodies are sheathed with metal 220
Few acids in 525
Metal for airplanes versus 211
Varnish-Drying rooms, causes of surface checks in 523
Woods, water-soluble contents of 526
WOOLSON, L M, ON MODERN HIGH-SPEED MARINE ENGINES 274
WOOLSON, L M, ON RECENT DEVELOPMENTS IN AIRCRAFT ENGINES 122, 297, 617
World, changing 194

Y
YOUNG, F M, ON RADIATOR CORES AND CONSTRUCTION 561
YOUNGER, JOHN, ON PRODUCTION OF CONNECTING-RODS 488
YOUNGER, JOHN, ON RESUME OF ANNUAL MEETING 268

Z
ZIMMERMAN, O B, ON ENGINEERING PROGRESS IN GENERAL-PURPOSE FARM-TRACTOR DEVELOPMENT 47

s
-
486
490

191
181
135
230
, 207
193
621
, 620
227
230
9, 619
193
229
, 192
137
625
624
194
622
, 133
231
228
134
e
, 619

n
8
628
185
628
nt 186
428
-
601
N
, 620
-
566
-
389
E
538
ES 118
K
7
A
K
534

599
of 599
f-
599

220
525
211
r-
523
526
ED
274
P-
97, 617
194

ND
561
N-
488
AL
268

G-
M-
47